ANALYTICAL INSTRUMENTS

A-96.150.331 / 131223

AMU-II Powercon

Operator's Manual

SWISS MADE

Customer Support

Swan and its representatives maintain a fully trained staff of technical specialists around the world. For any technical question, contact your nearest Swan representative, or the manufacturer:

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This manual applies to firmware V1.00 and higher.
The information contained in this document is subject to change without notice.

Table of Contents

Operator's Manual

This document describes the main steps for instrument setup, operation and maintenance.

1. Safety Instructions

General

The instructions included in this section explain the potential risks associated with instrument operation and provide important safety practices designed to minimize these risks.
If you carefully follow the information contained in this section, you can protect yourself from hazards and create a safer work environment.
More safety instructions are given throughout this manual, at the respective locations where observation is most important. Strictly follow all safety instructions in this publication.

Target audience

Operator: Qualified person who uses the equipment for its intended purpose.
Instrument operation requires thorough knowledge of applications, instrument functions and software program as well as all applicable safety rules and regulations.

OM location

Keep the Operator's Manual in proximity of the instrument.

Qualification, training

To be qualified for instrument installation and operation, you must:

- read and understand the instructions in this manual as well as the Material Safety Data Sheets.
- know the relevant safety rules and regulations.

1.1. Warning Notices

The symbols used for safety-related notices have the following meaning:

DANGER

Your life or physical wellbeing are in serious danger if such warnings are ignored.

- Follow the prevention instructions carefully.

WARNING

Severe injuries or damage to the equipment can occur if such warnings are ignored.

- Follow the prevention instructions carefully.

CAUTION

Damage to the equipment, minor injury, malfunctions or incorrect process values can be the consequence if such warnings are ignored.

- Follow the prevention instructions carefully.

Mandatory signs

The mandatory signs in this manual have the following meaning:

Safety goggles

Safety gloves

Warning signs The warning signs in this manual have the following meaning:


Electrical shock hazard


Corrosive


Harmful to health


Flammable


General warning


Attention

1.2. General Safety Regulations

Legal requirements

The user is responsible for proper system operation. All precautions must be followed to ensure safe operation of the instrument.

Spare parts and disposables

Use only official Swan spare parts and disposables. If other parts are used during the normal warranty period, the manufacturer's warranty is voided.

Modifications

Modifications and instrument upgrades shall only be carried out by an authorized service technician. Swan will not accept responsibility for any claim resulting from unauthorized modification or alteration.

WARNING

Mains voltage

Electrical shock hazard

- Maintenance on electronic parts shall be performed by authorized personnel only.
- Whenever maintenance on electronic parts is required, disconnect instrument power and power of devices connected to.
  - relay 1,
  - relay 2,
  - alarm relay
- If proper operation is no longer possible, the instrument must be disconnected from all power lines, and measures must be taken to prevent inadvertent operation.

2. Product Description

2.1. Description of the System

Application range

The AMU-II Powercon is applicable for the measurement of specific or acid conductivity in high purity water applications.
The transmitter can be used with a two-electrode conductivity sensor with an integrated Pt1000 temperature sensor, e.g. Swansensor UP-Con1000.

Special features

Many temperature compensation curves for specific conductivity measurement:

- none
- Coefficient
- Neutral salts
- High-purity water
- Strong acids
- Strong bases
- Ammonia, Eth. am.
- Morpholine

Standard temperature

The displayed conductivity value is compensated to 25 °C standard temperature.

Signal outputs

Two signal outputs programmable for measured values (freely scalable, linear, bilinear, log) or as continuous control output (control parameters programmable).

Current loop:	0/4–20 mA
Maximal burden:	510 Ω

Relays

Two potential-free contacts programmable as limit switches for measured values, controllers or timer with automatic hold function.
Maximum load: 100 mA/50 V

Alarm relays

Two potential-free contacts (one normally open and one normally closed). Summary alarm indication for programmable alarm values and instrument faults.

- Normally open contact: closed during normal operation, open on error and power loss.
- Normally closed contact: open during normal operation, closed on error and power loss.

Maximum load: 100 mA/50 V

Input

One input for potential-free contact to freeze the measured value or to interrupt control in automated installations. Programmable as HOLD or OFF function.

Communication interface (option)

- RS485 interface (galvanically separated) for communication via Modbus or Profibus DP
- USB interface for logger download
- HART interface
- RS232 interface for logger download with HyperTerminal

Safety features

No data loss after power failure. All data is saved in non-volatile memory. Overvoltage protection of inputs and outputs. Galvanic separation of measuring inputs from signal outputs.

2.2. Single Components

2.2.1 AMU-II Powercon Transmitter

General	Electronics housing:	Noryl® resin
	Protection degree:	up to IP54 (front)
	Ambient temperature:	-10 to +50 °C
	Humidity:	10–90% rel., non condensing
	Display:	backlit LCD, 75 x 45 mm
	Dimensions:	96 x 96 x 85 mm
	Cutout size	92 x 92 mm (DIN IEC 61554:2002-08)
	Weight:	0.30 kg
Power supply	AC variant:	100–240 VAC (±10%) 50/60 Hz (±5%)
	DC variant:	10–36 VDC
	Power consumption:	max. 3 VA
Conductivity sensor type	2-electrode sensor	

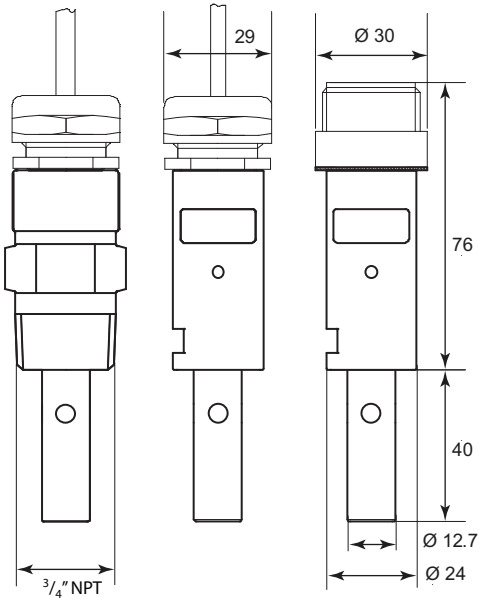
Measuring range	**Range**	**Resolution**
	0.055–0.999 µS/cm	0.001 µS/cm
	1.00–9.99 µS/cm	0.01 µS/cm
	10.0–99.9 µS/cm	0.1 µS/cm
	100–999 µS/cm	1 µS/cm
	1.00–2.99 mS/cm	0.01 mS/cm
	3.0–9.9 mS/cm	0.1 mS/cm
	10–30 mS/cm	1 mS/cm

Automatic range switching.
Accuracy: ±1% of measured value or ±1 digit (whichever is greater)
Ranges and accuracy valid for a cell constant of 0.0415 cm^{-1} (Swansensor UP-Con1000).

Sensor cell constant	0.005–10 cm^{-1}	
Temperature measurement	Pt1000 type sensor (DIN class A)	
	Measuring range:	-30 to +250 °C
	Resolution:	0.1 °C
Sample flow measurment	with digital SWAN sample flow sensor	

2.2.2 Swansensor UP-Con1000

The Swansensor UP-Con1000 is a 2-electrode conductivity sensor for the continuous measurement of specific and acid conductivity with a built-in temperature sensor.



Specifications UP-Con1000

Measuring range:	0.055 µS/cm–30 mS/cm
Accuracy (at 25 °C):	±1%

Measuring range and accuracy apply to the combination of Swansensor UP-Con1000 and AMU-II Powercon.

Operating conditions:

Continuous temperature:	100 °C at 6.5 bar
Max. temperature:	120 °C at 6.5 bar
Pressure:	max. 30 bar at 25 °C
Temperature sensor:	Pt1000
Cell constant:	~0.04 cm^{-1}

Sensor mounting

Available with SWAN slot-lock system for quick release in suitable flow cells or with 3/4” NPT thread.

2.2.3 Flow Cells

The following flow cells can be used:

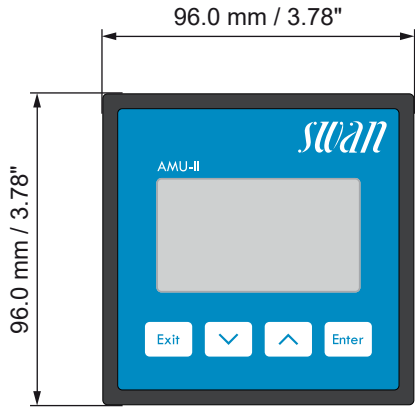
For a slot-lock sensor:
- B-Flow UP-CON with slot-lock
- Q-Flow L70 slot-lock
- QV-Flow UP-CON with slot-lock
- CATCON+ SL

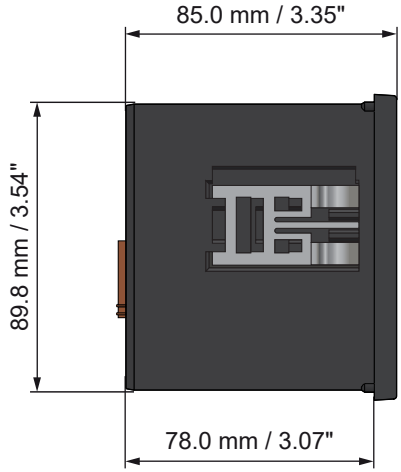
For a 3/4” NPT thread sensor:
- B-Flow L70
- Q-flow SS316L L70
- QV-flow SS316L L70

3. Installation

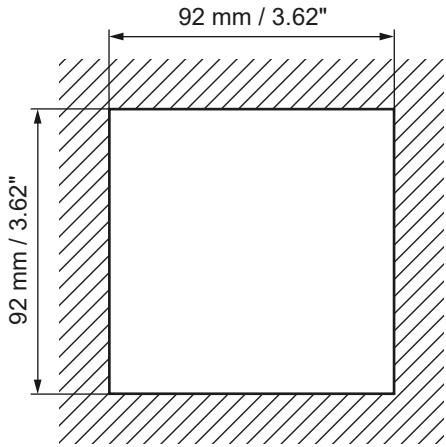
3.1. Mounting of the AMU-II Transmitter

Transmitter dimensions



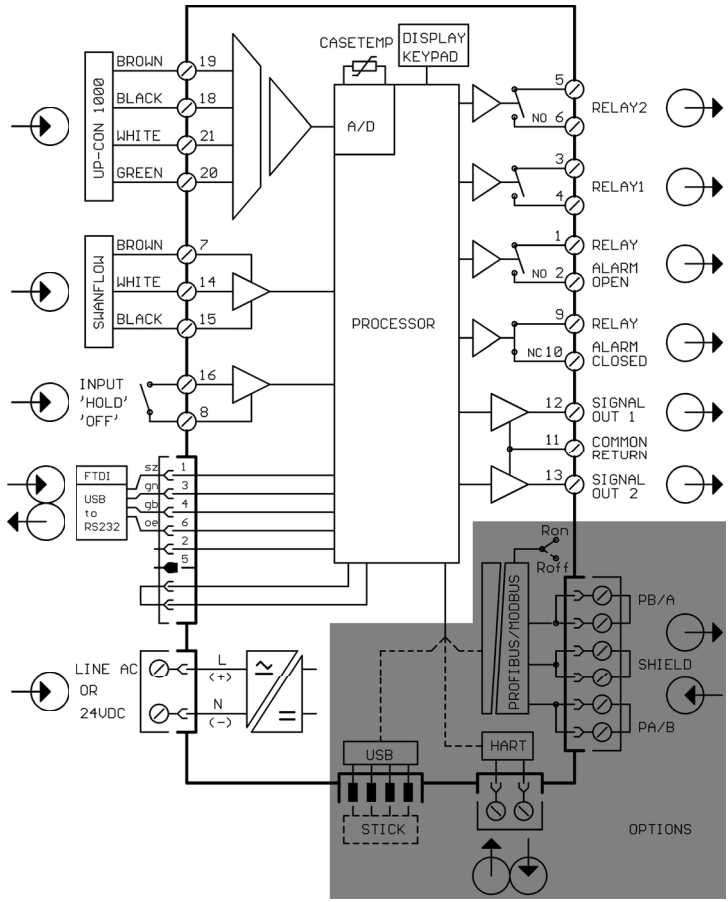


Cutout dimensions



3.2. Electrical Connections

Connection diagram



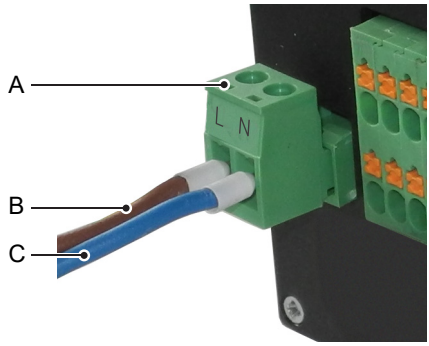
CAUTION

Use only the terminals shown in this diagram, and only for the mentioned purpose. Use of any other terminals will cause short circuits with possible corresponding consequences to material and personnel.

3.3. Power Supply

CAUTION

Do not apply power to the transmitter until all electrical connections have been made.



A *Pluggable terminal block*
B *Phase/(+) conductor*
C *Neutral/(-) conductor*

Installation requirements

The installation must meet the following requirements:

- Mains cable according to standards IEC 60227 or IEC 60245; flammability rating FV1
- Mains equipped with an external switch or circuit-breaker
  - near the instrument
  - easily accessible to the operator
  - marked as interrupter for AMU-II Powercon

3.4. Sensor

Terminals: see Connection diagram, p. 16.
Sensor settings: see Instrument Setup, p. 25.

3.5. Swan Flow Meter

Terminals: see Connection diagram, p. 16.

3.6. Input

Note: *Use only potential-free (dry) contacts.*

Terminals 16/8
For programming see Program List and Explanations, p. 51.

3.7. Relay Contacts

3.7.1 Alarm Relay

Note: *Max. load 100 mA/50 V*

Alarm output for system errors. For error codes see Error List, p. 43.

	Terminals	Description
NC Normally Closed	9/10	Active (opened) during normal operation. Inactive (closed) on error and loss of power.
NO Normally Open	1/2	Active (closed) during normal operation. Inactive (opened) on error and loss of power.

3.7.2 Relay 1 and 2

Note: *Max. load 100 mA/50 V*

Terminals 3/4: Relay 1
Terminals 5/6: Relay 2
For programming see Program List and Explanations, p. 51.

3.8. Signal Output 1 and 2 (Current Outputs)

Note: *Max. burden 510 Ω*
If signals are sent to two different receivers, use signal isolator (loop isolator).

Signal output 1: Terminals 12 (+) and 11 (-)
Signal output 2: Terminals 13 (+) and 11 (-)
For programming see Program List and Explanations, p. 51, Installation menu.

3.9. Interface Options

The functionality of the AMU-II Powercon can be expanded with one of the following interface options:

- RS485 with Modbus or Profibus protocol
- HART
- USB

3.9.1 Installation

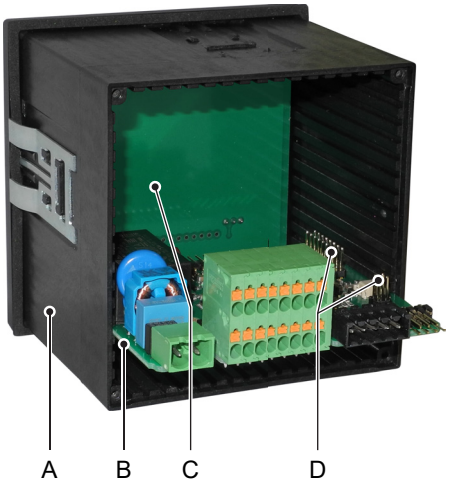
WARNING

Electrical shock hazard

Before opening the housing, disconnect the AMU-II transmitter from the power supply.

CAUTION

Observe precautions for handling electrostatic discharge sensitive devices.



A *Housing*
B *Mainboard*
C *Display board*
D *Pins for interface option*

To install an interface option, proceed as follows:

1 Switch power off.

2 Loosen the four screws at the back of the AMU-II transmitter and remove the backplate.

3 Pull the mainboard [B] completely out of the housing.

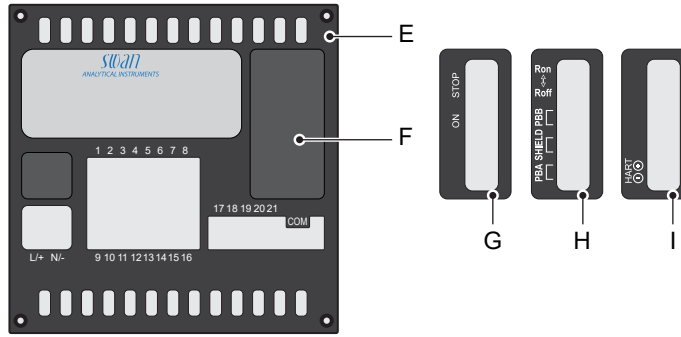
4 Plug the interface option onto the pins [D] on the mainboard.

5 Reinsert the mainboard into the housing, making sure to insert both boards into the correct guide grooves.

Mainboard:	Fourth guide groove from the bottom
Interface option:	First guide groove from the right

6 Carefully press the mainboard [B] against the display board [C] until it snaps into place.

Connector field



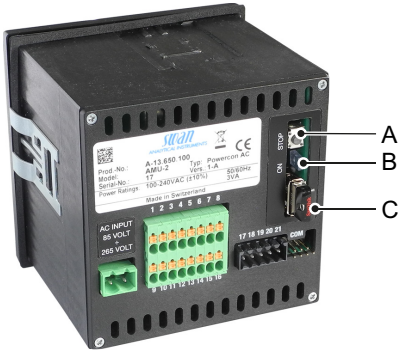
E *Backplate*
F *Covered connector field (condition at delivery)*
G *Labeling for USB option*
H *Labeling for RS485 option*
I *Labeling for HART option*

7 Remove the cover [F] from the connector field.

8 Apply the supplied sticker [G], [H] or [I] to the connector field.

9 Reinstall the backplate [E] onto the housing.

3.9.2 USB Option



A *Pushbutton*
B *Blue LED*
C *USB stick*

Menu item Calling up the <Operation>/<Eject USB Stick> menu item performs the following actions:

- the calibration history and the event history are copied to the USB stick,
- the logger file is completed (the next time the USB stick is inserted, a new file will be created),
- the USB stick is deactivated and can be removed.

Pushbutton Pressing the pushbutton [A] has the same effect as calling up the <Eject USB Stick> menu item.

Blue LED The blue LED is **on** if the USB stick is plugged in and ready to record data.
The blue LED is **off** when the USB stick has been deactivated and is ready to be removed.

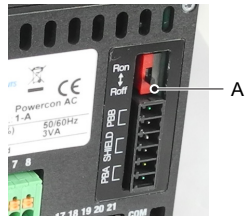
3.9.3 RS485 Option

Menu items

After the RS485 option has been installed, the <Installation>/<Interface> menu item becomes visible. Select Modbus RTU or Profibus as protocol.

Terminating resistor

On the last RS485 interface in the network, move the switch to the position marked “Ron” to activate the terminating resistor.



A *Switch for terminating resistor*

Interface Description

The Modbus and Profibus interface descriptions can be downloaded from www.swan.ch.

3.9.4 HART Option

Menu items

The configuration is done via the following menu items:
<Installation>/<Signal Outputs>/<Signal Output 3>:
<Installation>/<Interface>/<Device Address>:

Field Device Description

The HART® 7.x Field Device Specification can be downloaded from www.swan.ch.

3.10. RS232 Interface

The RS232 interface is located on the back of the AMU-II transmitter. Use the USB to RS232 interface converter available from Swan.

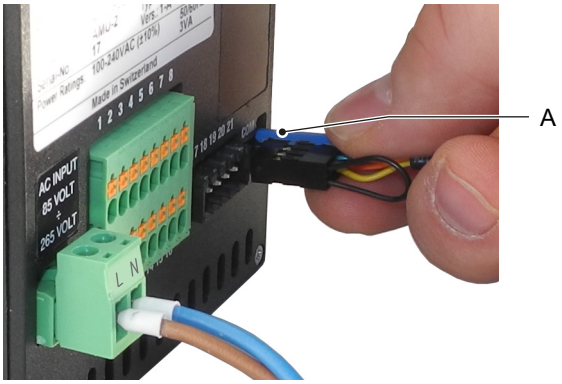
Downloading SwanTerminal

To use the functions provided via the RS232 interface, the SwanTerminal program is required, which can be downloaded from www.swan.ch.

Establishing a connection

To establish a connection between the PC and the AMU-II transmitter, proceed exactly in the following order:

1. Apply power to the AMU-II transmitter.
2. First connect the interface converter to the USB port of the PC without the AMU-II connected to the other end of the cable.
3. Wait a few seconds for the interface converter to be detected by the operating system.
4. Connect the other end of the cable to the pins labeled “COM” on the back of the AMU-II transmitter. The blue coding pin [A] must be at the top right corner.
   ⇒ *The AMU-II transmitter reboots automatically.*



5. Start the SwanTerminal program on the PC and select the correct COM port.
6. Click the button in SwanTerminal to connect to the AMU-II transmitter.

4. Instrument Setup

4.1. Establish Sample Flow

1 Open flow regulating valve.
2 Switch on power.
3 Adjust sample flow.

4.2. Programming

Sensor parameters

Program all sensor parameters in Menu 5.1.2.1, <Installation>/<Sensors>/<Sensor parameters>:

The sensor characteristics are printed on the label of each sensor.

87-344.203	UP-Con1000SL	Sensor type
SW-xx-xx-xx	ZK = 0.0417	Cell constant
SWAN AG	DT = 0.06 °C	Temperature correction

Enter the:
- Cell constant [cm^{-1}]
- Temperature correction [°C]
- Cable length
- Temperature compensation

Measuring unit

Menu 5.1.1.2
Set the <Measuring unit> according to your requirements:
- µS/cm
- µS/m

External devices

Program all parameters for external devices (interface, recorders, etc.) See program list and explanations 5.2 Signal Outputs, p. 55 and 4.2 Relay Contacts, p. 54.

Limits, alarms

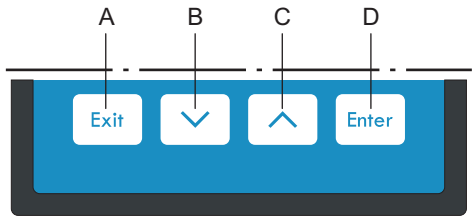
Program all parameters for instrument operation (limits, alarms). See program list and explanations 4.2 Relay Contacts, p. 54.

Temp. compensation

Menu 5.1.3
Choose between:
- none
- Coefficient
- Neutral salts
- High-purity water
- Strong acids
- Strong bases
- Ammonia, Ethanolamine
- Morpholine

5. Operation

5.1. Keys



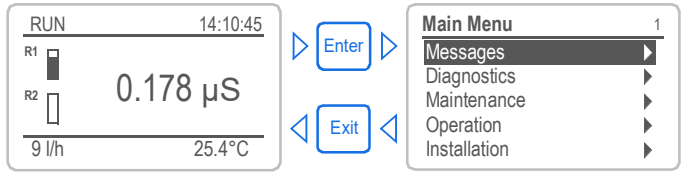
A to exit a menu or command (rejecting any changes)
to move back to the previous menu level

B to move DOWN in a menu list and to decrease digits

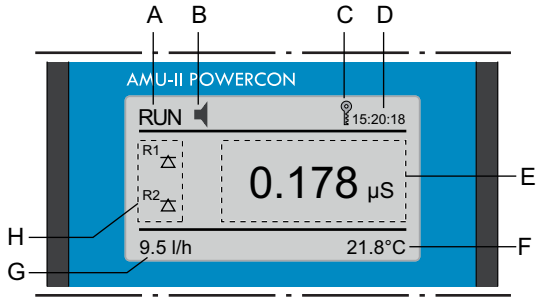
C to move UP in a menu list and to increase digits

D to open a selected sub-menu
to accept an entry

Program access, exit



5.2. Display



A RUN — normal operation

HOLD — input closed or cal delay: Instrument on hold (shows status of signal outputs).

OFF — input closed: control/limit is interrupted (shows status of signal outputs).

B Error — Error — Fatal error

C Keys locked, transmitter control via Profibus

D Time

E Process values

F Sample temperature

G Sample flow

H Relay status

Relay status, symbols

upper/lower limit not yet reached

upper/lower limit reached

control upw./downw. no action

control upw./downw. active, dark bar indicates control intensity

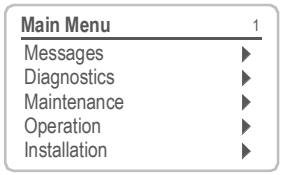
motor valve closed

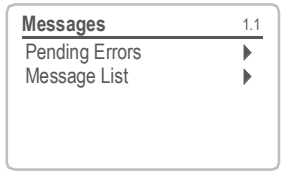
motor valve: open, dark bar indicates approx. position

timer

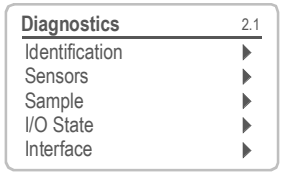
timer: timing active (hand rotating)

5.3. Software Structure

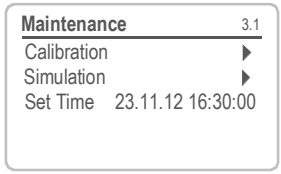




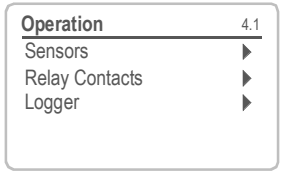
Menu **Messages 1**
Reveals pending errors as well as an event history (time and state of events that have occurred at an earlier point of time).
It contains user relevant data.



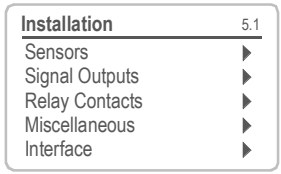
Menu **Diagnostics 2**
Provides user relevant instrument and sample data.



Menu **Maintenance 3**
For instrument calibration, relay and signal output simulation, and to set the instrument time.
It is used by the service personnel.



Menu **Operation 4**
User relevant parameters that might need to be modified during daily routine. Normally password protected and used by the process-operator.
Subset of menu 5 - Installation, but process-related.

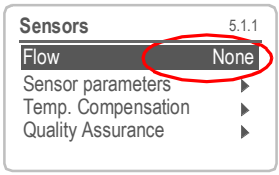


Menu **Installation 5**
For initial instrument set up by SWAN authorized person, to set all instrument parameters. Can be protected by means of password.

5.4. Changing Parameters and Values

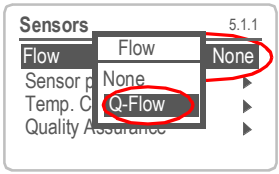
Changing parameters

The following example shows how to set the Q-Flow sensor:



1 Select the parameter you want to change.

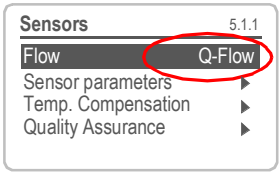
2 Press <Enter>



3 Press [▲] or [▼] key to highlight the required parameter.

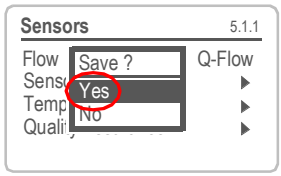
4 Press <Enter> to confirm the selection or <Exit> to keep the previous parameter).

⇒ *The selected parameter is indicated (but not saved yet).*



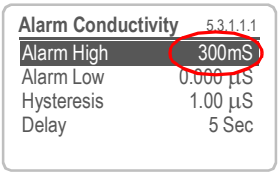
5 Press <Exit>.

⇒ *Yes is highlighted.*



6 Press <Enter> to save the new parameter.
⇒ *The system reboots, the new parameter is set.*

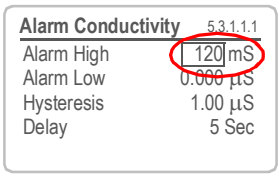
Changing values



1 Select the value you want to change.

2 Press <Enter>.

3 Set required value with [▲] or [▼] key.



4 Press <Enter> to confirm the new value.

5 Press <Exit>.
⇒ *Yes is highlighted.*

6 Press <Enter> to save the new value.

6. Maintenance

6.1. Maintenance Schedule

Monthly	◆ Check sample flow. ◆ Check cation exchanger resin (if any). The resin color changes to red/orange if exhausted.
If required	◆ Clean conductivity sensor. ◆ Replace the inlet filter of the cation exchanger bottle (if any).

Reagent consumption

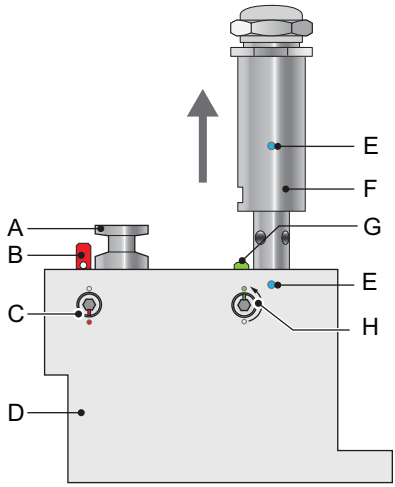
A 1 l resin bottle delivered by Swan lasts at 1 ppm alcalizing reagent (pH 9.4) for:

- 4 months at sample flow 10 l/h
- 5 months at sample flow 5 l/h

6.2. Stop of Operation for Maintenance

1. Stop sample flow.
2. Shut off power of the instrument.

6.3. Maintenance of the Sensor



A *Blind plug*
B *Locking pin locked*
C *Locking screw closed*
D *Flow cell*
E *Alignment marks*
F *Conductivity sensor*
G *Locking pin unlocked*
H *Locking screw open*

6.3.1 Remove the Sensor from the Flow Cell

To remove the sensor from the flow cell proceed as follows:

1. Press the locking pin [G] down.
2. Turn the locking screw [H] counterclockwise 180° using a 5 mm Allen key.
   ⇒ *The locking pin remains down.*
3. Remove the sensor.

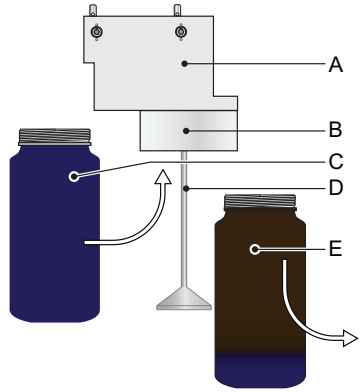
Cleaning If the sensor is slightly contaminated, clean it with soapy water and a pipe cleaner. If the sensor is strongly contaminated, dip the tip of the sensor into 5 % hydrochloric acid for a short time.

6.3.2 Install the Sensor into the Flow Cell

1. Make sure that the locking mechanism is in unlocked position (locking pin in position [G] and security screw in position [H]).
2. Put the sensor into the flow cell with the alignment marks [E] in line.
3. Turn the locking screw clockwise 180° using a 5 mm Allen key.
   ⇒ *The locking pin moves up in lock position.*

6.4. Changing the Ion Exchanger

The resin of the ion exchanger changes its color from dark violet to brown if the capacity is exhausted. The resin should be changed before no violet resin is left or the cation conductivity rises above the normal value. At a concentration of 1 ppm alcalizing reagent, one resin filling will last for roughly 4 months if sample flow is 10 l/h, or 5 months if sample flow is 5 l/h.



A *Flow cell*
B *Bottle holder*
C *New cation exchanger bottle*
D *Inlet filter holder*
E *Exhausted cation exchanger bottle*

1 Stop sample flow.

2 Slightly squeeze the exhausted cation exchanger bottle [E] before removing.
⇒ *Thus no water will spill out of the flow cell when loosening the bottle.*

3 Unscrew and carefully remove the exhausted cation exchanger bottle [E].

4 Fill high purity water into the new cation exchanger bottle [C], until the water level in the bottle reaches the beginning of the thread.

5 Carefully, without spilling water, push the cation exchanger bottle over the inlet filter holder [D] into the bottle holder [B].

6 Screw the cation exchanger bottle into the bottle holder.

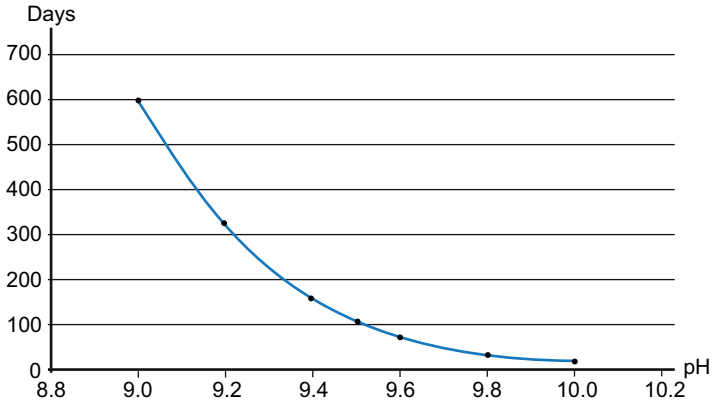
Do not tighten the bottle too firmly, this could damage the gasket.

7 Open and adjust the sample flow.

8 Pre-rinse the new cation exchanger resin until the display shows stable measuring values.

Operation time 1 liter Swan resin

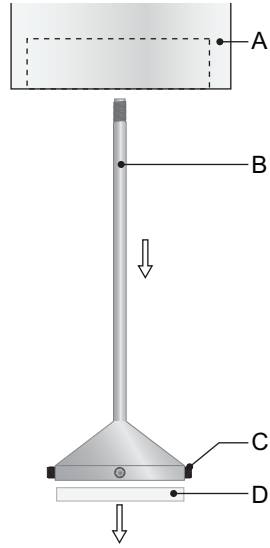
This graphic shows the average exhaust time (flow 6 l/h) and must be verified by the user.



Cation conductivity.
Operational days for 1 l of cation exchange resin with an exchange capacity of 1.8 eq/l.
Flow rate 6 l/h alkalization with ammonia. (safety margin of 15% subtracted).

6.5. Changing the Inlet Filter

The inlet filter of the cation exchanger prevents the resin from entering the flow cell. It is located in the inlet filter holder [B].



A *Bottle holder*
B *Inlet filter holder*
C *Allen screws*
D *Inlet filter*

1 Stop sample flow.

2 Slightly squeeze the cation exchanger bottle [E] before removing.
⇒ *Thus no water will spill out of the flow cell when loosening the bottle.*

3 Unscrew and carefully remove the cation exchanger bottle.

4 For better access to the Allen screws [C] unscrew and remove the filter holder [B] from the bottle holder [A].

5 Loosen the 4 Allen screws with a 1.5 mm Allen key.

6 Carefully remove the inlet filter [D] with a screw driver no.0 from the inlet filter holder.

7 Insert a new inlet filter.

8 Tighten the 4 Allen screws slightly.

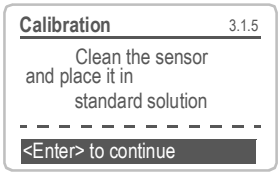
9 Screw the cation exchanger bottle into the bottle holder.

Do not tighten the bottle too firmly, this could damage the gasket.

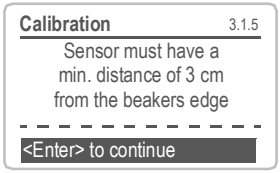
6.6. Calibration

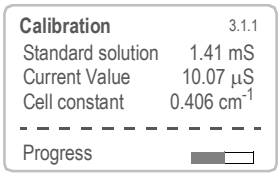
A calibration is necessary if the cell constant of a sensor is not known. To perform a calibration proceed as follows:

1. Stop the sample flow.
2. Navigate to menu <Maintenance>/<Calibration>.
3. Press [Enter] and follow the dialog on the display.
4. Remove the sensor from the flow cell.
5. Clean the sensor carefully and rinse it with clean water, see Maintenance of the Sensor, p. 32.
6. Use a one liter beaker and fill it with one liter of calibration solution.
7. Put the sensor into the beaker filled with calibration solution.



8. Wait at least 5 minutes to permit temperature equilibration between sensor and calibration solution.
9. Start the calibration procedure.





10. Press [Enter], to save the values if the calibration was successful.
11. Install the sensor into the flow cell.

Note: *The temperature algorithm of the 1.413 mS/cm at 25 °C calibration solution is stored in the AMU-II Powercon transmitter. Provided that the calibration solution has a temperature between 5 °C and 50 °C, and the built-in temperature sensor is in temperature equilibrium with the solution by waiting at least 5 minutes, a correct calibration will be made (independent of the*

chosen temperature compensation set in menu 5.1.3.1). During calibration, control is interrupted. The signal outputs are frozen if hold has been programmed (menu 4.2.4.2). Otherwise the outputs track the measured value. Hold after calibration is indicated by Hold on the display.

6.7. Quality Assurance of the Instrument

Quality assurance level

Central feature of the quality assurance function is the assignment of the monitored process to a quality assurance level.
There are three predefined levels plus a user level. Hereby the inspection interval, the deviation limits of temperature and measuring result between the inspection equipment and the monitoring instrument are defined.

- Level 1: **Trend;** Measurement used as an additional information to follow the process indicating trends.
- Level 2: **Standard;** Monitoring of conductivity. In case of instrument failure, other parameters can be used for process monitoring.
- Level 3: **Crucial;** Monitoring of critical processes, value is used for control of another part or subsystem (valve, dosing unit, etc.).

Additional level:

- Quality level 4: **User;** User defined inspection interval, maximal deviation of temperature and measuring result.

Limits and intervals:

Quality level	max. deviation temperature [°C][a)]	max. deviation result [%]	min. inspection interval
0: Off	**off**	**off**	off
1: Trend	**0.5 °C**	**10%**	annual
2: Standard	**0.4 °C**	**5%**	quarterly
3: Crucial	**0.3 °C**	**5%**	monthly
4: User	**0–2 °C**	**0–20%**	annual, quarterly, monthly

a) sample temperature must be 25 °C +/-5 °C.

Procedure The standard workflow consists of the following steps:

1. Activation of Swan quality assurance procedure
2. Pre-test
3. Connecting instruments
4. Carrying out comparison measurement
5. Completion of the measurement

Note: *The procedure should only be carried out by qualified personnel.*

6.7.1 Activate Swan Quality Assurance Procedure

Activate the quality assurance procedure for the process monitor(s) to be checked by selecting the quality level in menu 5.1.4.1. The corresponding submenus then become visible.
The activation is necessary the first time only.

6.7.2 Pre-Test

- AMI Inspector Conductivity:
  - Check certificate; Certificate not older than one year.
  - Check battery; The battery should be completely charged. Remaining operating time on display minimum 20 hours.
  - Disable temperature compensation (set to “none”)
- On-line instrument
  - Good order and condition; Flow cell free of particles, Sensor surface free of deposits.
  - Check message list: Review the message list in menu 1.3 and check for alarms (as for example flow alarms). If alarms occur frequently remove cause before starting the procedure.

6.7.3 Connecting Sample Lines

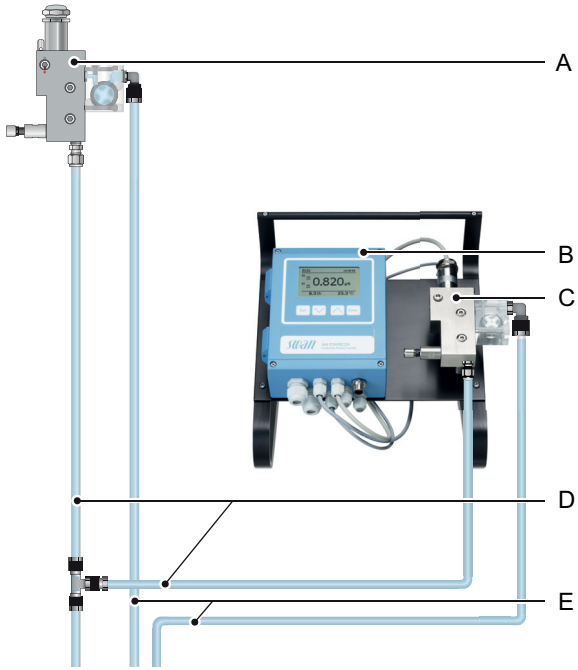
The choice of sampling depends strongly on local conditions on site. Possible sampling:

- via sample point,
- via T-fitting or
- via piggyback/downstream

Note:

- *avoid ingress of air, use screwed fitting,*
- *sample as near as possible to the process monitor,*
- *while the measurement is running, wait approx. 10 minutes until the measured value and the temperature have stabilized.*

Example As an example following picture shows the connection of the reference instrument via T-fitting to the process monitor.



A *Flow cell of online instrument*
B *AMI Inspector Conductivity*
C *Flow cell of reference instrument*
D *Sample inlets with T-fitting*
E *Sample outlets*

1 Stop sample flow to the online instrument by closing the appropriate valve.

2 Connect sample line of the online instrument with the sample inlet of the AMI Inspector Conductivity. Use the supplied FEP tube.

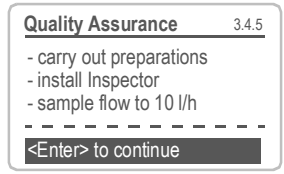
3 Connect the sample outlet of the AMI Inspector Conductivity to the sample outlet funnel of the online instrument.

4 Switch on the AMI Inspector Conductivity. Open the flow regulating valve and regulate the sample flow to 5-10 l/h. The flow rate is shown on the display of the AMI Inspector Conductivity.

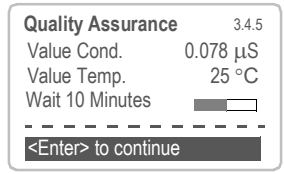
6.7.4 Carry Out Comparison Measurement

1 Navigate to <Maintenance>/<Quality Assurance>.

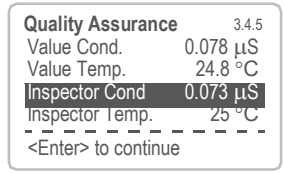
2 Follow the dialog on the display.



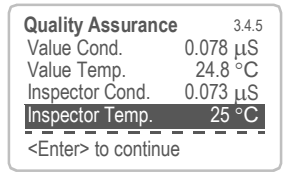
3 Carry out pre test preparations.
Connect instruments.
Regulate sample flow to 10 l/h using the appropriate valve.



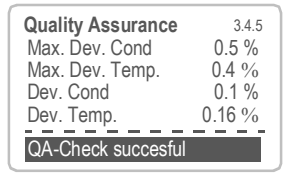
4 Wait 10 minutes whilst measurement is running.
Press [Enter] to continue.



5 Read the µS value of the AMI Inspector Conductivity and enter it in the “Inspector” field.
Press [Enter] to confirm.



6 Read the temperature value of the AMI Inspector Conductivity and enter it in the “Inspector Temp” field.
Press [Enter] to confirm.
Press [Enter] to continue.



⇒ *The results are saved in the QA history regardless if successful or not.*

6.8. Longer Stop of Operation

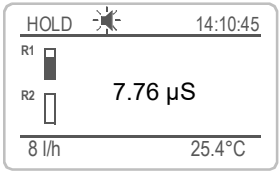
1. Shut off power of the instrument.
2. Stop sample flow.
3. Slightly squeeze the ion exchanger bottle (if present).
   ⇒ *Thus no water will spill out of the flow cell when loosening the bottle.*
4. Unscrew and carefully remove the ion exchanger bottle with the exhausted resin.
5. Close the ion exchanger bottle with the screw cover and store it in a frost-protected room.
6. Screw on an empty bottle.

7. Error List

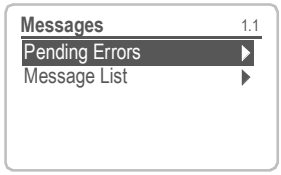
Error
Non-fatal error. Indicates an alarm if a programmed value is exceeded. Such errors are marked **E0xx** (bold and black).

Fatal error (blinking symbol)
Control of dosing devices is interrupted.
The indicated measured values are possibly incorrect.
Fatal errors are divided in the following two categories:

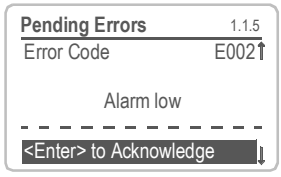
- Errors which disappear if correct measuring conditions are recovered (i.e. Sample Flow low).
  Such errors are marked **E0xx** (bold and orange)
- Errors which indicate a hardware failure of the instrument.
  Such errors are marked **E0xx** (bold and red)



Error or fatal error
Error not yet acknowledged.
Check **Pending Errors 1.1.5** and take corrective action.



Navigate to <Messages>/<Pending Errors>.



Press [Enter] to acknowledge a pending error.

⇒ *The error is reset and saved in the message list.*

Error	Description	Corrective action
E001	Cond. Alarm high	– Check process – Check programmed value, see 5.3.1.1, p. 60
E002	Cond. Alarm low	– Check process – Check programmed value, see 5.3.1.1, p. 60
E007	Sample Temp. high	– Check process – Check programmed value, see 5.3.1.3, p. 60
E008	Sample Temp. low	– Check process – Check programmed value, see 5.3.1.3, p. 60
E009	Sample Flow high	– Check sample inlet pressure – Check programmed value, see 5.3.1.2.2, p. 60
E010	Sample Flow low	– Check sample inlet pressure – Check flow regulating valve – Check programmed value, see 5.3.1.2.35, p. 60
E011	Temp. shorted	– Check wiring of temperature sensor – Check temperature sensor
E012	Temp. disconnected	– Check wiring of temperature sensor – Check temperature sensor
E013	Case Temp. high	– Check case/environment temperature – Check programmed value, see 5.3.1.4, p. 61
E014	Case Temp. low	– Check case/environment temperature – Check programmed value, see 5.3.1.5, p. 61
E017	Control time-out	– Check control device or programming in Installation, Relay contact, Relay 1/2 5.3.2/3, p. 61
E018	Quality Assurance	– Perform QA Procedure using reference instrument, e.g. AMI Inspector
E024	Input active	– See If Fault Yes is programmed in Menu see 5.3.4, p. 64
E026	IC LM75	– Call service
E030	EEProm Frontend	– Call service

Error	Description	Corrective action
E031	Cal. Recout	– Call service
E032	Wrong Frontend	– Call service
E033	Power-on	– None, normal status
E034	Power-down	– None, normal status

8. Program Overview

For explanations about each parameter of the menus see Program List and Explanations, p. 51.

- Menu 1 **Messages** informs about pending errors and maintenance tasks and shows the error history. Password protection possible. No settings can be modified.
- Menu 2 **Diagnostics** is always accessible for everybody. No password protection. No settings can be modified.
- Menu 3 **Maintenance** is for service: Calibration, simulation of outputs and set time/date. Please protect with password.
- Menu 4 **Operation** is for the user, allowing to set limits, alarm values, etc. The presetting is done in the menu Installation (only for the system engineer). Please protect with password.
- Menu 5 **Installation**: Defining assignment of all inputs and outputs, measuring parameters, interface, passwords, etc. Menu for the system engineer. Password strongly recommended.

8.1. Messages (Main Menu 1)

Pending Errors 1.1*	*Pending Errors*	1.1.5*	* Menu numbers
Message List 1.2*	*Number*	1.2.1*	
	Date, Time		

8.2. Diagnostics (Main Menu 2)

Identification	Designation	AMU-II Powercon		* Menu numbers
2.1*	Version	V1.00-06/21		
	Factory Test	*Instrument*	2.1.3.1*	
	2.1.3*	*Motherboard*		
		Front End		
	Operating Time	*Years / Days / Hours / Minutes / Seconds*		2.1.4.1*
	2.1.4*			
Sensors	**Cond. Sensor**	*Current value*		
2.2*	2.2.1*	*Raw value*		
		Cell constant		
		Cal. History	*Number, Date, Time*	2.2.1.5.1*
		2.2.1.5*		
	Miscellaneous	Case Temp.	*2.2.2.1**	
	2.2.2*			
Sample	*Sample ID*	2.3.1*		
2.3*	*Temperature*			
	(Pt1000)			
	Sample Flow			
	Raw value			
I/O State	*Alarm Relay*	2.4.1*		
2.4*	*Relay 1/2*	2.4.2*		
	Input			
	Signal Output 1/2			
Interface	*Protocol*	2.5.1*		
2.5*	*Baud rate*			

8.3. Maintenance (Main Menu 3)

Calibration	*Follow instructions*	3.1.5*		*Menu numbers
3.1*				
Simulation	*Alarm Relay*	3.3.1*		
3.2*	*Relay 1*	3.3.2*		
	Relay 2	3.3.3*		
	Signal Output 1	3.3.4*		
	Signal Output 2	3.3.5*		
Set Time	*(Date), (Time)*			
3.4*				

8.4. Operation (Main Menu 4)

Sensors	*Filter Time Const.*	4.1.1*		
4.10*	*Hold after Cal*	4.1.2*		
Relay Contacts	**Alarm Relay**	**Alarm Conductivity**	*Alarm High*	4.2.1.1.1*
4.2*	4.2.1*	4.2.1.1*	*Alarm Low*	4.2.1.1.25*
			Hysteresis	4.2.1.1.35*
			Delay	4.2.1.1.45*
	Relay 1/2	*Setpoint*	4.2.x.100*	
	4.2.2*/4.2.3*	*Hysteresis*	4.2.x.200*	
		Delay	4.2.x.30*	
	Input	*Active*	4.2.4.1*	
	4.2.4*	*Signal Outputs*	4.2.4.2*	
		Output / Control	4.2.4.3*	
		Fault	4.2.4.4*	
		Delay	4.2.4.5*	
Logger	*Log Interval*	4.3.1*		
4.3*	*Clear Logger*	4.3.2*		

8.5. Installation (Main Menu 5)

Sensors	**Flow**	*None*		*Menu numbers
5.1*	*5.1.1**	*Q-Flow*		
	Sensor parameters	*Cell Constant*	5.1.2.1*	
	5.1.2*	*Temp. Corr.*	5.1.2.2*	
		Cable length	5.1.2.3*	
		Meas. unit	5.1.2.4	
	Temp.Compensation	Comp.	*none*	
	5.1.3*	5.1.3.1*	*Coefficient*	
			Neutral salts	
			High-purity water	
			Strong acids	
			Strong bass	
			Ammonia, Etham	
			Morpholine	
	Quality Assurance	Level	*0: Off*	
	5.1.4*	5.1.4.1*	*1: Trend*	
			2: Standard	
			3: Crucial	
Signal Outputs	**Signal Output 1/2**	*Parameter*	5.2.1.1/5.2.2.1*	
5.2*	5.2.1/5.2.2*	*Current Loop*	5.2.1.2/5.2.2.2*	
		Function	5.2.1.3/5.2.2.3*	
		Scaling	*Range Low*	5.2.x.40.10/11*
		5.2.x.40	*Range High*	5.2.x.40.20/21*
Relay Contacts	**Alarm Relay**	**Alarm Conductivity**	*Alarm High*	5.3.1.1.1.1*
5.3*	5.3.1*	5.3.1.1*	*Alarm Low*	5.3.1.1.1.25*
			*Hysteresis **	5.3.1.1.1.35
			Delay	5.3.1.1.1.45*
		Sample Flow	*Flow Alarm*	5.3.1.2.1*
		5.3.1.2*	*Alarm High*	5.3.1.2.2
			Alarm Low	5.3.1.2.35
		Sample Temp.	*Alarm High*	5.3.1.3.1*
		5.3.1.3*	*Alarm Low*	5.3.1.3.25*
		Case Temp.high	5.3.1.4*	
		Case Temp.low	5.3.1.5*	

	Relay 1/2	*Function*	5.3.2.1 / 5.3.3.1*	*Menu numbers
	5.3.2 / 5.3.3*	*Parameter*	5.3.2.20 / 5.3.3.20*	
		Setpoint	5.3.2.300 / 5.3.3.301*	
		Hysteresis	5.3.2.400 / 5.3.3.401*	
		Delay	5.3.2.50 / 5.3.3.50*	
	Input	*Active*	5.3.4.1*	
	5.3.4*	*Signal Outputs*	5.3.4.2*	
		Output/Control	5.3.4.3*	
		Fault	5.3.4.4*	
		Delay	5.3.4.5*	
Miscellaneous	*Language*	5.4.1*		
5.4*	*Set defaults*	5.4.2*		
	Load Firmware	5.4.3*		
	Password	*Messages*	5.4.4.1*	
	5.4.4*	*Maintenance*	5.4.4.2*	
		Operation	5.4.4.3*	
		Installation	5.4.4.4*	
	Sample ID	5.4.5*		
Interface	*Protocol*	5.5.1*		
5.5*	*Device Address*	5.5.21*		
	Baud Rate	5.5.31*		
	Parity	5.5.41*		

9. Program List and Explanations

1 Messages

1.1 Pending Errors

1.1.5 Provides the list of active errors with their status (active, acknowledged). If an active error is acknowledged, the alarm relay is active again. Cleared errors are moved to the message list.

1.2 Message List

1.2.1 Shows the error history: Error code, date / time of issue and status (active, acknowledged, cleared). 65 errors are memorized. Then the oldest error is cleared to save the newest error (circular buffer).

2 Diagnostics

In diagnostics mode, the values can only be viewed, not modified.

2.1 Identification

Desig.: Designation of the instrument.
Version: Firmware of the instrument (e.g. V1.00-06/21).

2.1.4 **Factory Test**: Test date of the instrument.

2.1.5 **Operating Time:** Years, days, hours, minutes, seconds.

2.2 Sensors

2.2.1 Cond. Sensor
Current value in µS
Raw value in µS
Cell Constant

2.2.1.4 *QA History:* Review the QA values (Number, Date-Time, Deviation Conductivity, Deviation Temperature) of the last quality assurance procedures. Only for diagnostic purpose. Max. 65 data records are memorized.

2.2.1.5 *Cal. History*: Review diagnostic values of the last calibrations.*Only for diagnostic purpose.*
Number; Date, Time
Cell constant
Max. 64 data records are memorized. One process calibration corresponds to one data record.

2.2.2 **Miscellaneous**:

2.2.2.1 *Case Temp:* Shows the current temperature in [°C] inside the transmitter.

2.3 Sample

2.3.1 *Sample ID*: Shows the identification assigned to a sample. This identification is defined by the user to identify the location of the sample.
Temperature: Shows the current sample temperature in °C.
(Pt 1000): Shows the current temperature in Ohm.
Sample Flow: Shows the current sample flow in l/h and the raw value in Hz.

2.4 I/O State

Shows current status of all in- and outputs.

2.4.1/2.4.2

Alarm Relay:	Active or inactive.
Relay 1 and 2:	Active or inactive.
Input:	Open or closed.
Signal Output 1 and 2:	Actual current in mA

2.5 Interface

Only available if optional interface is installed.
Review programmed communication settings.

3 Maintenance

3.1 Calibration

Follow the commands on the screen. Save the value with the <enter> key.

3.2 Simulation

To simulate a value or a relay state, select the
- alarm relay,
- relay 1 and 2
- signal output 1 and 2

with the [▲] or [▼] key.
Press the <Enter> key.
Change the value or state of the selected item with the [▲] or [▼] key.
Press the <Enter> key.
⇒ *The value is simulated by the relay/signal output.*

Alarm Relay:	Active or inactive.
Relay 1 and 2:	Active or inactive.
Signal Output 1 and 2:	Actual current in mA

At the absence of any key activities, the instrument will switch back to normal mode after 20 min. If you quit the menu, all simulated values will be reset.

3.3 Set Time

Adjust date and time.

3.4 Quality Assurance

Performs a quality assurance according to your settings. Follow the commands on the screen.

4 Operation

4.1 Sensors

4.1.1 *Filter Time Constant:* Used to damp noisy signals. The higher the filter time constant, the slower the system reacts to changes of the measured value.
Range: 5–300 Sec

4.1.2 *Hold after Cal.:* Delay permitting the instrument to stabilize again after calibration. During calibration plus hold-time, the signal outputs are frozen (held on last valid value), alarm values, limits are not active.
Range: 0–6‘000 Sec

4.2 Relay Contacts

See Relay Contacts, p. 18

4.3 Logger

The instrument is equipped with an internal logger. The logger data can be downloaded to a PC using the built-in RS232 interface.
The logger can save approx. 1500 data records. The Records consists of: Date, time, alarms, measured value, measured value uncompensated, temperature, flow.
Range: 1 second to 1 hour

4.3.1 *Log Interval:* Select a convenient log interval. Consult the table below to estimate the max logging time. When the logging buffer is full, the oldest data record is erased to make room for the newest one (circular buffer).

Interval	1 s	5 s	1 min	5 min	10 min	30 min	1 h
Time	25 min	2 h	25 h	5 d	10 d	31 d	62 d

4.3.2 *Clear Logger:* If confirmed with **yes**, the complete logger data is deleted. A new data series is started.

5 Installation

5.1 Sensors

5.1.1 Flow:
- None
- Q-Flow

Select “Q-Flow” when using a Swan flow cell with integrated flow meter.

5.1.2 Sensor parameters

5.1.2.1 *Cell Constant*: Enter the cell constant printed on the sensor label.
Range: 0.005000 cm^{-1} – 11.00 cm^{-1}

5.1.2.2 *Temp. Corr*: Enter the temperature correction printed on the sensor label.
Range: -2 °Cto 2 °C

5.1.2.3 *Cable length*: Enter the cable length.
Range: 0.0 m to 30.0 m

5.1.2.4 *Meas. unit*: Select the measuring unit as µS/cm or as µS/m.

5.1.3 Temp. comp:

5.1.3.1 *Comp.*: Available compensation models are:

- none
- Coefficient
- Neutral salts
- High purity water
- Strong acids
- Strong bases
- Ammonia, Eth.am.
- Morpholine

5.1.4 Quality Assurance: Switch Quality Assurance on or off.

5.1.4.1 *Level*: Select quality level:

- Level 0: Off
  Quality assurance procedure switched off. Any additional QA menus are hidden.
- Level 1: Trend
- Level 2: Standard
- Level 3: Crucial
- Level 4: User

Edit user-specific limits in menu 5.1.4.2

5.2 Signal Outputs

Note: *The navigation in the menu <Signal Output 1> and <Signal Output 2> is equal. For reason of simplicity only the menu numbers of Signal Output 1 are used in the following.*

5.2.1 Signal Output 1: Assign process value, the current loop range and a function to each signal output.

5.2.1.1 *Parameter:* Assign one of the process values to the signal output.
Available values:

- Conductivity
- Temperature
- Sample flow
- Cond. uc

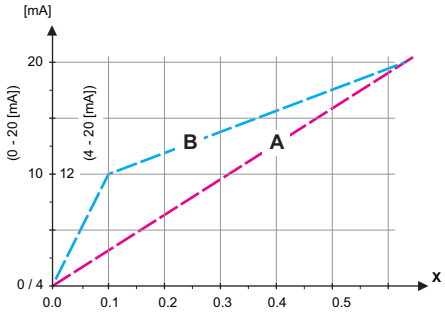
5.2.1.2 *Current Loop:* Select the current range of the signal output.
Make sure the connected device works with the same current range.
Available ranges: 0–20 mA or 4–20 mA

5.2.1.3 *Function:* Define if the signal output is used to transmit a process value or to drive a control unit. Available functions are:

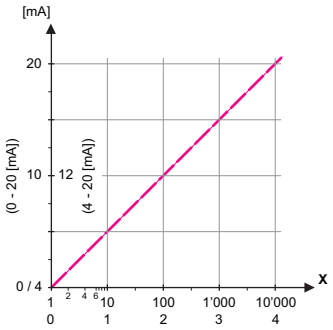
- Linear, bilinear or logarithmic for process values.
  See As process values, p. 56
- Control upwards or control downwards for controllers.
  See As control output, p. 57

As process values

The process value can be represented in 3 ways: linear, bilinear or logarithmic. See graphs below.



A *linear*
B *bilinear*
X *Measured value*



X *Measured value (logarithmic)*

5.2.1.40 **Scaling:** Enter beginning and end point (range low and high) of the linear or logarithmic scale. In addition, the midpoint for the bilinear scale.

Parameter Conductivity:

5.2.1.40.10 Range low: 0 µS–300 mS

5.2.1.40.20 Range high: 0 µS–300 mS

Parameter Temperature

5.2.1.40.11 Range low: -25 to +270 °C

5.2.1.40.21 Range high: -25 to +270 °C

Parameter Sample flow

5.2.1.40.12 Range low: 0–50 l/h

5.2.1.40.22 Range high: 0–50 l/h

Parameter Cond. uc:

5.2.1.40.13 Range low: 0 µS–300 mS

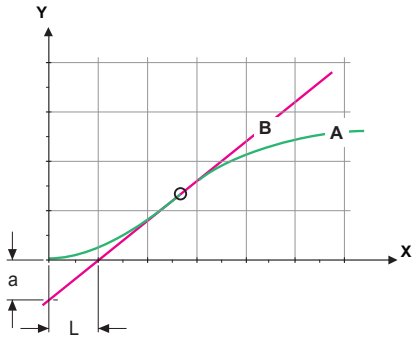
5.2.1.40.23 Range high: 0 µS–300 mS

As control output

Signal outputs can be used for driving control units. We distinguish different kinds of controls:

- *P-controller:* The controller action is proportional to the deviation from the setpoint. The controller is characterized by the P-Band. In the steady-state, the setpoint will never be reached. The deviation is called steady-state error.
  Parameters: setpoint, P-Band
- *PI-controller:* The combination of a P-controller with an I-controller will minimize the steady-state error. If the reset time is set to zero, the I-controller is switched off.
  Parameters: setpoint, P-Band, reset time.
- *PD-controller:* The combination of a P-controller with a D-controller will minimize the response time to a fast change of the process value. If the derivative time is set to zero, the D-controller is switched off.
  Parameters: setpoint, P-Band, derivative time.
- *PID-controller:* The combination of a P-, an I- and a D-controller allows a proper control of the process.
  Parameters: setpoint, P-Band, reset time, derivative time.

Ziegler-Nichols method for the optimization of a PID controller:
Parameters: Setpoint, P-Band, Reset time, Derivative time



A *Response to maximum control output* ***Xp*** *= 1.2/a*
B *Tangent on the inflection point* ***Tn*** *= 2L*
X *Time* ***Tv*** *= L/2*

The point of intersection of the tangent with the respective axis will result in the parameters a and L.
Consult the manual of the control unit for connecting and programming details. Choose control upwards or downwards.

Control upwards or downwards

Setpoint: User-defined process value for the selected parameter.
P-Band: Range below (upwards control) or above (downwards control) the set-point, within the dosing intensity is reduced from 100% to 0% to reach the setpoint without overshooting.

5.2.1.43 Control Parameters: if Parameters = Conductivity

5.2.1.43.10 Setpoint
Range: 0 µS–300 mS

5.2.1.43.20 P-Band:
Range: 0 µS–300 mS

5.2.1.43 Control Parameters: if Parameters = Temperature

5.2.1.43.11 Setpoint
Range: -25 to +270 °C

5.2.1.43.21 P-Band:
Range: 0 to +100 °C

5.2.1.43 Control Parameters: if Parameters = Sample flow

5.2.1.43.12 Setpoint
Range: 0 –50 l/h

5.2.1.43.22 P-Band:
Range: 0 –50 l/h

5.2.1.43 Control Parameters: if Parameters = Cond. uc.

5.2.1.43.13 Setpoint
Range: 0 µS–300 mS

5.2.1.43.23 P-Band:
Range: 0 µS–300 mS

5.2.1.43.3 *Reset time:* The reset time is the time till the step response of a single I-controller will reach the same value as it will be suddenly reached by a P-controller.
Range: 0–9'000 sec

5.2.1.43.4 *Derivative time:* The derivative time is the time till the ramp response of a single P-controller will reach the same value as it will be suddenly reached by a D-controller.
Range: 0–9'000 sec

5.2.1.43.5 *Control timeout:* If a controller action (dosing intensity) is constantly over 90% during a defined period of time and the process value does not come closer to the setpoint, the dosing process will be stopped for safety reasons.
Range: 0–720 min

5.3 Relay Contacts

5.3.1 **Alarm Relay:** The alarm relay is used as cumulative error indicator. Under normal operating conditions the contact is active.
The contact is inactive at:

- Power loss
- Detection of system faults like defective sensors or electronic parts
- High case temperature
- Process values out of programmed ranges.

Program alarm levels, hysteresis values and delay times for the following parameters:

- Alarm Conductivity
- Sample Flow
- Sample Temp.
- Case Temp. high
- Case Temp. low

5.3.1.1 Alarm Conductivity

5.3.1.1.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E001, is displayed in the message list.
Range: 0 µS–300 mS

5.3.1.1.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay is activated and E002 is displayed in the message list.
Range: 0 µS–300 mS

5.3.1.1.35 *Hysteresis:* Within the hyst. range, the relay does not switch. This prevents damage of relays contacts when the measured value fluctuates around the alarm value.
Range. 0 µS–300 mS

5.3.1.1.45 *Delay:* Duration, the activation of the alarm relay is retarded after the measuring value has risen above/fallen below the programmed alarm.
Range: 0–28‘800 Sec

5.3.1.2 Sample Flow: Define at which sample flow an alarm should be issued.

5.3.1.2.1 *Flow Alarm:* Program if the alarm relay should be activated if there is a flow alarm. Choose between yes or no. The flow alarm will always be indicated in the display, pending error list, saved in the message list and the logger.
Available values: Yes or no

> ***Note:*** *Sufficient flow is essential for a correct measurement. We recommend to program yes.*

5.3.1.2.2 *Alarm High:* If the measuring values rises above the programmed value E009 will be issued.
Range: 10–50 l/h

5.3.1.2.35 *Alarm Low:* If the measuring values falls below the programmed value E010 will be issued.
Range: 0–9 l/h

5.3.1.3 Sample Temp.

5.3.1.3.1 *Alarm High:* If the measured value rises above the alarm high value, the alarm relay is activated and E007, is displayed in the message list.
Range: 30–200 °C

5.3.1.3.25 *Alarm Low:* If the measured value falls below the alarm low value, the alarm relay is activated and E008 is displayed in the message list.
Range: -10 to +20 °C

5.3.1.4 *Case Temp. high:* Set the alarm high value for temperature of electronics housing. If the value rises above the programmed value E013 is issued.
Range: 30–75 °C

5.3.1.5 *Case Temp. low:* Set the alarm low value for temperature of electronics housing. If the value falls below the programmed value E014 is issued.
Range: -10 to +20 °C

5.3.2/3 Relay 1 and 2: The function of relay contacts 1 or 2 is defined by the user.

Note: *The navigation in the menu <Relay 1> and <Relay 2> is equal. For reason of simplicity only the menu numbers of Relay 1 are used in the following.*

1 First select the functions as:
- Limit upper/lower,
- Control upwards/downwards,
- Timer
- Fieldbus

2 Then enter the necessary data depending on the selected function. The same values may also be entered in menu 4.2 Relay Contacts, p. 54

5.3.2.1 Function = Limit upper/lower:

When the relays are used as upper or lower limit switches, program the following:

5.3.2.20 *Parameter:* select a process value

5.3.2.300 *Setpoint*: If the measured value rises above respectively falls below the set-point, the relay is activated.

Parameter	Range
Conductivity	0 µS–300 mS
Temperature	-25 to +270 °C
Sample flow	0–50 l/h
Cond. uc	0 µS–300 mS

5.3.2.400 *Hysteresis:* within the hysteresis range, the relay does not switch. This prevents damage of relay contacts when the measured value fluctuates around the alarm value.

Parameter	Range
Conductivity	0 µS–300 mS
Temperature	0–100 °C
Sample flow	0–50 l/h
Cond. uc	0 µS–300 mS

5.3.2.50 *Delay:* Duration, the activation of the alarm relay is retarded after the measuring value has risen above/fallen below the programmed alarm.
Range. 0–600 Sec

5.3.2.1 Function = Control upwards/downwards:

The relays may be used to drive control units such as solenoid valves, membrane dosing pumps or motor valves. When driving a motor valve both relays are needed, relay 1 to open and relay 2 to close the valve.

5.3.2.22 *Parameter:* Choose on of the following process values.
- Conductivity)
- Temperature
- Sample Flow
- Cond. uc

5.3.2.32 **Settings***:* Choose the respective actuator:
- Time proportional
- Frequency
- Motor valve

5.3.2.32.1 Actuator = Time proportional

Examples of metering devices that are driven time proportional are solenoid valves, peristaltic pumps.
Dosing is controlled by the operating time.

5.3.2.32.20 *Cycle time:* duration of one control cycle (on/off change).
Range: 0–600 sec.

5.3.2.32.30 *Response time:* Minimal time the metering device needs to react.
Range: 0–240 sec.

5.3.2.32.4	**Control Parameters** Range for each Parameter same as 5.2.1.43, p. 58.
5.3.2.32.1	Actuator = Frequency
	Examples of metering devices that are pulse frequency driven are the classic membrane pumps with a potential free triggering input. Dosing is controlled by the repetition speed of dosing shots.
5.3.2.32.21	*Pulse frequency:* Max. pulses per minute the device is able to respond to. Range: 20–300/min.
5.3.2.32.31	**Control Parameters** Range for each Parameter same as 5.2.1.43, p. 58.
5.3.2.32.1	Actuator = Motor valve
	Dosing is controlled by the position of a motor driven mixing valve.
5.3.2.32.22	*Run time:* Time needed to open a completely closed valve. Range: 5–300 Sec.
5.3.2.32.32	*Neutral zone:* Minimal response time in % of the runtime. If the requested dosing output is smaller than the response time, no change will take place. Range: 1–20 %
5.3.2.32.4	**Control Parameters** Range for each Parameter same as 5.2.1.43, p. 58.
5.3.2.1	Function = Timer
	The relay will be activated repetitively depending on the programmed time scheme.
5.3.2.24	*Mode:* Operating mode (interval, daily, weekly)
5.3.2.340	*Interval/Start time/Calendar:* Depending on operating mode.
5.3.2.44	*Run time:* time the relay stays active. Range: 5–32’400 Sec
5.3.2.54	*Delay:* during run time plus the delay time the signal and control outputs are held in the operating mode programmed below. Range: 0–6’000 Sec
5.3.2.6	*Signal Outputs:* select the behavior of the signal outputs when the relay closes. Available values: cont., hold, off
5.3.2.7	*Output/Control:* select the behavior of the control outputs when the relay closes. Available values: cont., hold, off

5.3.2.1 Function = Fieldbus

The relay is switched via Profibus or Modbus. No further parameters are needed.

5.3.4 **Input:** The functions of the relays and signal outputs can be defined depending on the position of the input contact, i.e. no function, closed or open.

5.3.4.1 *Active:* Define when the input should be active:

No:	Input is never active.
When closed	Input is active if the input relay is closed
When open:	Input is active if the input relay is open

5.3.4.2 *Signal Outputs:* Select the operation mode of the signal outputs when the relay is active:

Continuous:	Signal outputs continue to issue the measured value.
Hold:	Signal outputs issue the last valid measured value. Measurement is interrupted. Errors, except fatal errors, are not issued.
Off:	Set to 0 or 4 mA respectively. Errors, except fatal errors, are not issued.

5.3.4.3 *Output/Control:* (relay or signal output):
Continuous: Controller continues normally.
Hold: Controller continues on the last valid value.
Off: Controller is switched off.

5.3.4.4 *Fault:*

No:	No message is issued in pending error list and the alarm relay does not close when input is active. Message E024 is stored in the message list.
Yes:	Message E024 is issued and stored in the message list. The Alarm relay closes when input is active.

5.3.4.5 *Delay:* Time which the instrument waits, after the input is deactivated, before returning to normal operation.
Range: 0–6‘000 Sec

5.4 Miscellaneous

5.4.1 *Language:* Set the desired language.
Available settings: German / English / French / Spanish / Chinese

5.4.2 *Set defaults:* Reset the instrument to factory default values in three different ways:

- **Calibration:** Sets calibration values back to default. All other values are kept in memory.
- **In parts:** Communication parameters are kept in memory. All other values are set back to default values.
- **Completely:** Sets back all values including communication parameters.

5.4.3 *Load Firmware:* Firmware updates should be done by instructed service personnel only.

5.4.4 **Password:** Select a password different from 0000 to prevent unauthorized access to the menus “Messages”, “Maintenance”, “Operation” and “Installation”.
Each menu may be protected by a *different* password.
If you forgot the passwords, contact the closest SWAN representative.

5.4.5 *Sample ID:* Identify the process value with any meaning full text, such as KKS number.

5.5 Interface

Select one of the following communication protocols:

5.5.1 *Protocol:* **Profibus**

5.5.20	Device address:	Range: 0–126
5.5.30	ID no.:	Range: analyzer; manufacturer; multivariable
5.5.40	Local operation:	Range: enabled, disabled

5.5.1 *Protocol:* **Modbus RTU**

5.5.21	Device address:	Range: 0–126
5.5.31	Baud rate:	Range: 1 200–115 200 baud
5.5.41	Parity:	Range: none, even, odd

5.5.1 *Protocol:* **HyperTerminal**

	Baud rate:	Range: 1200–115200 baud

5.5.1 *Protocol:* **HART**

	Device address:	Range: 0–63

10. Default Values

Operation:		
Sensors	Filter Time Const.:	10 s
	Hold after Cal.:	300 s
Relay Contacts	Alarm Relay	same as in Installation
	Relay 1/2	same as in Installation
	Input	same as in Installation
Logger	Logger Interval:	30 min
	Clear Logger:	no
Installation:		
Sensors	Flow:	None
	Sensor Parameters; Cell Constant	0.0415 cm^{-1}
	Sensor Parameters; Temp. corr.	0.00 °C
	Sensor Parameters; Cable length	0.0 m
	Sensor Parameters; Meas. unit	µS/cm
	Temp. Compensation; Comp.	none
	Quality Assurance; Level	0: Off
Signal Output 1	Parameter:	Conductivity
	Current loop:	4–20 mA
	Function:	linear
	Scaling: Range low:	0.000 µS
	Scaling: Range high:	1 mS
Signal Output 2	Parameter:	Temperature
	Current loop:	4–20 mA
	Function:	linear
	Scaling: Range low:	0 °C
	Scaling: Range high:	50 °C
Alarm Relay	Alarm Conductivity:	
	Alarm high:	300 mS
	Alarm low:	0.000 µS
	Hysteresis:	1.00 µS
	Delay:	5 s
	Sample Flow:	
	Flow Alarm	yes
	Alarm high:	20 l/h
	Alarm low:	5 l/h
	Sample Temp:	
	Alarm High:	160 °C
	Alarm Low:	0 °C

	Case Temp. high: 65 °C
	Case Temp. low: 0 °C
Relay 1/2	Function: limit upper
	Parameter: Conductivity
	Setpoint: 30 mS
	Hysteresis: 10 µS
	Delay: 30 s
	If Function = Control upw. or dnw:
	Parameter: Cond 1(sc)
	Settings: Actuator: Frequency
	Settings: Pulse Frequency: 120/min
	Settings: Control Parameters: Setpoint: 30 mS
	Settings: Control Parameters: P-band: 10 µS
	Settings: Control Parameters: P-band: 1 mS
	Settings: Control Parameters: Reset time: 0 s
	Settings: Control Parameters: Derivative Time: 0 s
	Settings: Control Parameters: Control Timeout: 0 min
	Settings: Actuator: Time proportional
	Cycle time: 60 s
	Response time: 10 s
	Settings: Actuator Motor valve
	Run time: 60 s
	Neutral zone: 5%
	If Function = Timer:
	Mode: Interval
	Interval: 1 min
	Mode: daily
	Start time: 00.00.00
	Mode: weekly
	Calendar; Start time: 00.00.00
	Calendar; Monday to Sunday: Off
	Run time: 10 s
	Delay: 5 s
	Signal output: cont
	Output/Control: cont
Input	Active when closed
	Signal Outputs hold
	Output/Control off
	Fault no
	Delay 10 s

Miscellaneous	Language:	English
	Set default:	no
	Load firmware:	no
	Password:	for all modes 0000
	Sample ID:	- - - - - - - -

11. Notes

swan
ANALYTICAL INSTRUMENTS

A-96.150.331 / 131223

Swan Products - Analytical Instruments for:

Swan is represented worldwide by subsidiary companies and distributors and cooperates with independent representatives all over the world. For contact information, please scan the QR code.

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SWISS MADE

AMU-II Powercon